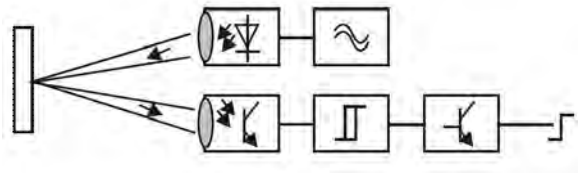
GENERAL INFORMATION FOR PHOTOELECTRIC SENSORS

What Are Photoelectric Sensors?

Photoelectric Sensors as "artificial eyes" are fundamental to the automation technology. They are used where a reliable and non-contact detection of the exact position of objects is required. The material of the object to be detected is of no importance. Compared to inductive sensors,photoelectric sensors have a much higher sensing zone.TEHORN provides many varieties of Sensor, including diffuse-reflective, through-beam, retro-reflective, and distance-settable Sensors, as well as Sensors with either built-in or separate amplifiers, etc.

Photoelectric Sensors detect objects, changes in surface conditions, and other items through a variety of optical properties. A Photoelectric Sensor consists primarily of an Emitter for emitting light and a Receiver for receiving light. When emitted light is interrupted or reflected by the sensing object, it changes the amount of light that arrives at the Receiver. The Receiver detects this change and converts it to an electrical output. The light source for the majority of Photoelectric Sensors is infrared or visible light (generally red, or green/blue for identifying colors).



Features

(1) Long Sensing Distance

A Through-beam Sensor, for example, can detect objects more than 10 m away. This is impossible with magnetic, ultrasonic, or other sensing methods.

(2) Virtually No Sensing Object Restrictions

These Sensors operate on the principle that an object interrupts or reflects light, so they are not limited like proximity sensors to detecting metal objects. This means they can be used to detect virtually any object, including glass, plastic, wood, and liquid.

(3) Fast Response Time

The response time is extremely fast because light travels at high speed and the sensor performs no mechanical operations because all circuits are comprised of electronic components.

(4) High Resolution

The incredibly high resolution achieved with these Sensors derives from advanced design technologies that yielded a very small spot beam and a unique optical system for receiving light. These developments enable detecting very small objects, as well as precise position detection.

(5) Non-contact Sensing

There is little chance of damaging sensing objects or Sensors because objects can be detected without physical contact. This ensures years of sensor service.

(6) Color Identification

The rate at which an object reflects or absorbs light depends on both the wavelength of the emitted light and the color of the object. This property can be used to detect colors.

(7) Easy Adjustment

Positioning the beam on an object is simple with models that emit visible light because the beam is visible.

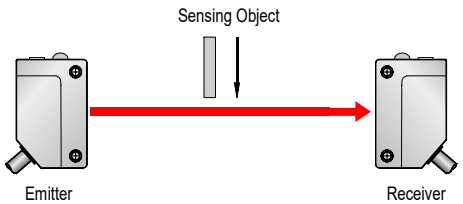
Classification

1) Through-beam Sensors

The Emitter and Receiver are installed opposite each other to enable the light from the Emitter to enter the Receiver. When a sensing object passing between the Emitter and Receiver interrupts the emitted light, it reduces the amount of light that enters the Receiver. This reduction in light intensity is used to detect an object.

Features

- Stable operation and long sensing distances ranging from several centimeters to several tens of meters.
- Sensing position unaffected by changes in the sensing object path.
- Operation not greatly affected by sensing object gloss, color, or inclination.

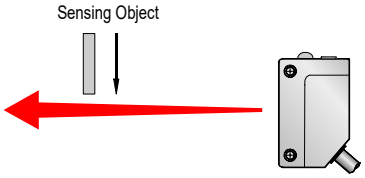


2) Diffuse-reflective Sensors

The Emitter and Receiver are installed in the same housing and light normally does not return to the Receiver. When light from the Emitter strikes the sensing object, the object reflects the light and it enters the Receiver where the intensity of light is increased. This increase in light intensity is used to detect the object.

Features

- Sensing distance ranging from several centimeters to several meters.
- Easy mounting adjustment.
- The intensity of reflected light and operating stability vary with the conditions (e.g., color and smoothness) on the surface of the sensing object.



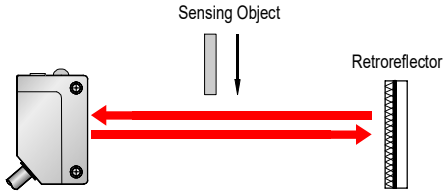
GENERAL INFORMATION FOR PHOTOELECTRIC SENSORS

3) Retro-reflective Sensors

The Emitter and Receiver are installed in the same housing and light from the Emitter is normally reflected back to the Receiver by a Reflector installed on the opposite side. When the sensing object interrupts the light, it reduces the amount of light received. This reduction in light intensity is used to detect the object.

Features

- Sensing distance ranges from several centimeters to several meters.
- Simple wiring and optical axis adjustment (labor saving).
- Operation not greatly affected by the color or angle of sensing objects.
- Light passes through the sensing object twice, making these Sensors suitable for sensing transparent objects.
- Sensing objects with a mirrored finish may not be detected because the amount of light reflected back to the Receiver from such shiny surfaces makes it appear as though no sensing object is present. This problem can be overcome using the MSR function.

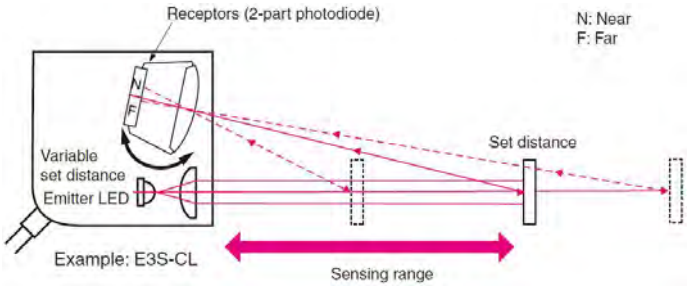


4) Distance-settable Sensors

The Receiver in the Sensor is either a 2-part photodiode or a position detector. The light reflected from the sensing object is concentrated on the Receiver.Sensing is based on the principle of triangulation, which states that where the beam is concentrated depends on the distance to the sensing object. The following shows a detection system that uses a 2-part photodiode. The end of thephotodiode nearest the case is called the N (near) end and the other end is called the F (far) end. When a sensing object reaches the preset position, the reflected light is concentrated midway between the N end and the F end and the photodiodes at both ends receive an equal amount of light. If the sensing object is closer to the sensor, then the reflected light is concentrated at the N end. Conversely, the reflected light is concentrated at the F end when the sensing object is located farther than the preset distance. The sensor calculates the difference between the light intensity at the N end and F end to determine the position of the sensing object.

Features of Distance-settable Sensors

- Operation not greatly affected by sensing object surface conditions or color.
- Operation not greatly affected by the background.



Background Suppression(BGS) and Foreground Suppression(FGS)

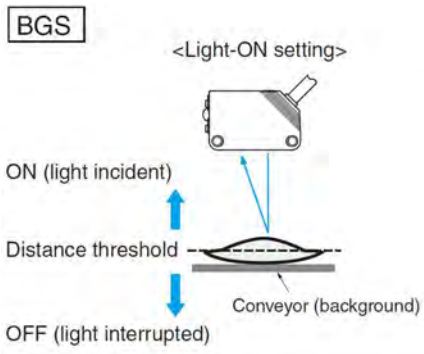
The BGS function prevents any background object (i.e., the conveyor) beyond the set distance from being detected. The FGS function prevents objects closer than the set distance or objects that reflect less than a specified amount of light to the Receiver from being detected. Objects that reflect less than a specified amount of light are as follows:

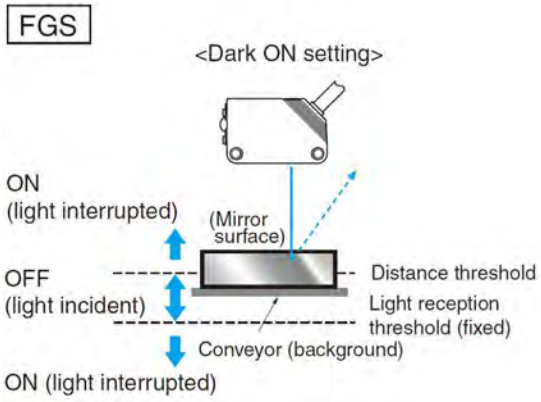
(1) Objects with extremely low reflectance and objects that are darker than black paper.
(2) Objects like mirrors that return virtually all light back to the Emitter.
(3) Uneven, glossy surfaces that reflect a lot of light but disperse the light in random directions.

Reflected light may return to the Receiver momentarily for item (3) due to sensing object movement. In that case, an OFF delay timer or some other means may need to be employed to prevent chattering.

Features of Distance-settable Sensors

- Small differences in height can be detected (BGS and FGS).
- The effects of sensing object color are minimized (BGS and FGS).
- The effects of background objects are minimized (BGS).
- Sensing object irregularities may affect operation (BGS and FGS).





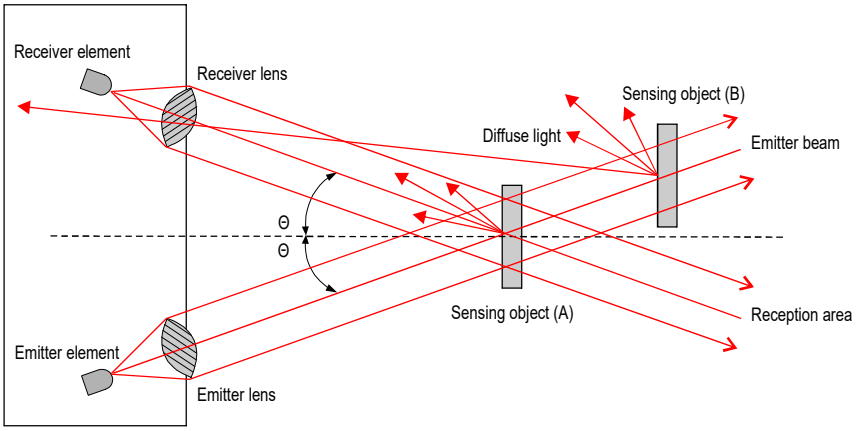
GENERAL INFORMATION FOR PHOTOELECTRIC SENSORS

3) **Limited-reflective Sensors**

In the same way as for Diffuse-reflective Sensors, Limited-reflective Sensors receive light reflected from the sensing object to detect it. The Emitter and Receiver are installed to receive only regular-reflection light, so only objects that are a specific distance (area where light emission and reception overlap) from the Sensor can be detected. In the figure on the right, the sensing object at (A) can be detected while the object at (B) cannot.

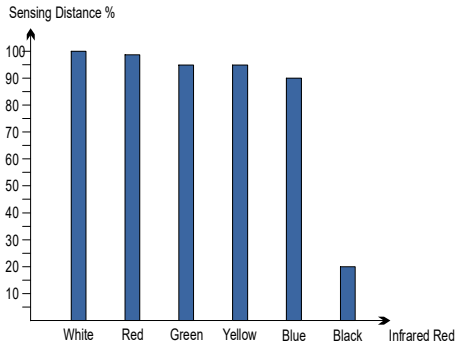
Features

- Small differences in height can be detected.
- The distance from the Sensor can be limited to detect only objects in a specific area.
- Operation is not greatly affected by sensing object colors.
- Operation is greatly affected by the glossiness or inclination of the sensing object.



Explanation of Terms

Switching distance for diffuse reflective sensors
Detecting distance for optical photoelectric sensors varies according to the material to sense. The parameters that influence the maximum capacity of the sensor are mainly the color and the brightness or roughness of the surface to be detected. Data below are approximate value and are the result of lab tests with mat paper targets 10x10cm wide of the following colors.

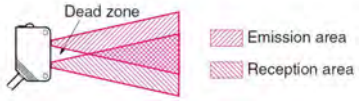


Switching distance for Retro-reflective sensor and Thrugh-beam sensor
It is the maximum distance between photocell and reflector or between emitter and receiver.

Nominal switching distance(Sn) according to EN 60947-5-2
It is the conventional value of operating distance for photoelectric switches. It does not take into account either manufacturing tolerance(+/-10%) or variations due to external conditions such as voltage and temperature.

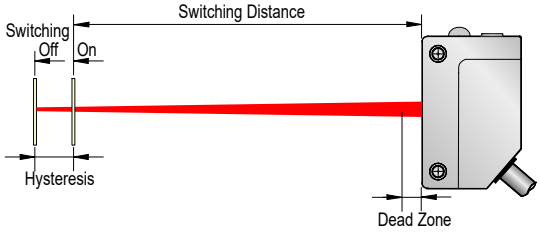
Usable operating distance(Su) according to En 60947-5-2
It is the assured operating distance within the specified voltage, function and temperature intervals; it is included between 81% and 121% of the nominal switching distance Sn(0.81Sn ≤ Su ≤ 1.21Sn) for photoelectric switches.

Example for Diffuse-reflective Sensor



Assured operating distance (Sa) according to En 60947-5-2
It is the distance at which the photoelectric switches works safely in all the temperature and voltage intervals as specified for the same sensor. The assured operating distance is included between 0 and 0.81 of Sn only in the case of photoelectric switches without blind zone and referring to specific targets.

Dead Zone
It is the area between the “photoelectric switches active face” and the minimum switching distance, within which an object can not be detected.



Hysteresis
It is the maximum distance between the detected and non detected points. These points are obtained by moving the object towards or away from the photocell axis. Data are expressed in percentage to the value of the sensing distance.

GENERAL INFORMATION FOR PHOTOELECTRIC SENSORS

Electrical Parameters

Nominal Voltage: It is indicates the maximum and minimum values within which sensors work correctly.

Residual Ripple: The maximum admissible ripple of the DC supply voltage shown as percentage to its medium value.

Max. Output Current: It shows maximum output current a sensor can cope with when voltage is at maximum nominal value.

Voltage Drop: Voltage drop on switching circuit when output transistor is conducting.

Start Up Delay: Time interval between sensor supply connection and active output.
This time interval is to avoid the switch output being in an undefined state when the systerm is switched on.

Absorption: This in the consumption of the photocell referred to the maximum limits of the nominal voltage and without load.

Polarity Inversion Protection: Available in EC supplied type, it prevents the sensor from being damage when supply cables are incorrectly connected.

Short Circuit Protection: A protection in case of short circuit or overload to avoid inner circuit damage. Once the short circuit is eliminated the photocell resets.

Sensitivity Adjustment: A part of a photoelectric switch used to set the operating distance within the sensing distance.
This adjustment is usually done by a potentiometer or by Teach-in.

Output for PNP Mode: Output in solid state with PNP transistor; when it is activated, it supplies a positive voltage whose reading is near the supply positive pole(+).

Output for PNP Mode: Output in solid state with NPN transistor; when it is activated, it supplies a negative voltage whose reading is near the supply negative pole(-).

Output for Light On(L.O.) Mode: It shows for the photoelectric sensor the case of reception of direct or reflected light.

Output for Light On(L.O.) Mode: It shows for the photoelectric sensor the case of failure in receiving the direct or reflected light.

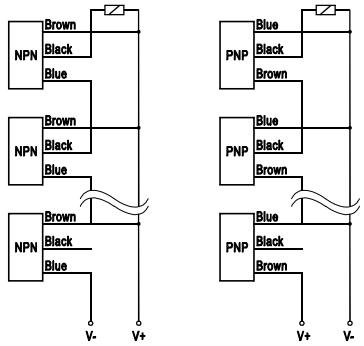
Output for Relay N.O. Mode: Open contact when the photoelectric sensor is in “normal” condition, that is to say not activated.

Output for Relay N.C. Mode: Closed contact when the photoelectric sensor is in “normal” condition, that is to say not activated.

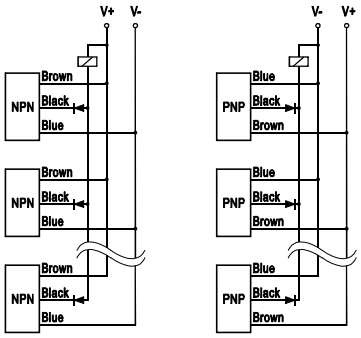
Connection for Photoelectric Sensors

Connection In Series(AND) with PNP Output or NPN Output
Connected in this way sensors activated one output when activated simultaneously. When using this type of connection keep into account as follows:

1) Drop of Voltage for each sensor(<1.5V);
2) The Maximum load current of the sensor used together within the absorption of each sensor(<30mA);
3) The maximum number of sensors connectable in series is 3.

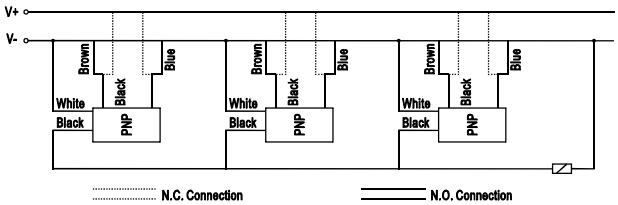


Connection In Parallel Series(OR) with PNP Output or NPN Output
Connected in this way sensors can activate the common output indipendently, when activated. When omitting the diodes indicated in the diagram, use sensors with the final stage which has an open collector(NO).

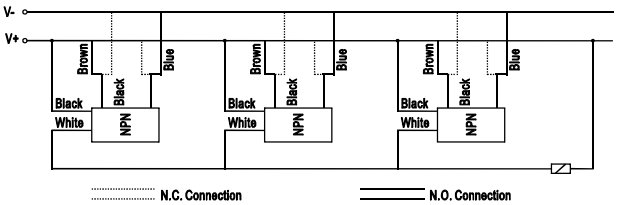


Connection In Parallel Series(OR) with Programmable Output
When connected in this way sensors can activate the common output indipendently, when energize. Thanks to the really low leakage current, there is no actual limitation in the number of sensor that can be connected in parallel, providing that the minimum current of load accumulated is mA.

PNP Configuration



NPN Configuration



SELECTION GUIDE FOR PHOTOELECTRIC SENSORS

P B D A 020 A

Type
P: Photoelectric Proximity Sensors
B: Laser Proximity Sensors

Mounting
A: M8 Steel with Thread Body
B: M12 Brass with Thread Body
C: M12 PBT Resin with Thread Body
D: M18 Brass with Thread Body
E: M18 PBT Resin with Thread Body
F: M30 Brass with Thread Body
G: M30 PBT Resin with Thread Body
H: Square 31 PBT Resin Body
K: Square 50 PBT Resin Body
M: Square 80 ABS Resin Body

Sensing Mode
C: Through-beam Mode
D: Diffuse Mode
B: Diffuse with Background Suppression Mode
X: Limit Area Detection with Diffused Beam
Y: Limit Area Detection with Spot Beam
R: Retro-reflective Mode
F: Retro-reflective With Polarizing Filter
T: Retro-reflective For Transparent

Output Function
A: PNP-NO(L.O.)
B: PNP-NC(D.O.)
C: NPN-NO(L.O.)
D: NPN-NC(D.O.)
E: PNP-NO+NC(L.O.+ D.O.)
F: NPN-NO+NC(L.O.+ D.O.)
G: PNP-NO or NC(L.O.or D.O.)
H: NPN-NO or NC(L.O.or D.O.)
K: DC Emitter
L: AC Emitter
P: AC-NO MOSFET Output
Q: AC-NC MOSFET Output
X: AC/DC Emitter
Y: AC/DC Relay Output
T: PNP/NPN-NO/NC Output
R: DC Relay Output

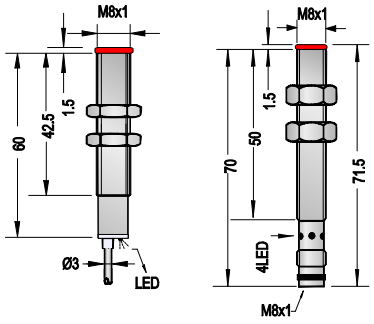
Sensing Distance
008: 80mm
015: 150mm
020: 200mm
150: 1.5m
200: 2m
10M: 10m
M10: 100m
M15: 150m

Connection
A: Standard 2m PVC Cable
B: Customized PVC Cable
C: Standard 2m PUR Cable
D: Customized PUR Cable
G: 4 Pin M8 Pico-style Connector
H: 4 Pin M12 Euro-style Connector
X: Pigtail with 4 Pin M8 Pico-style Connector
Y: Pigtail with 5 Pin M12 Euro-style Connector
T: Terminal with PG Connector

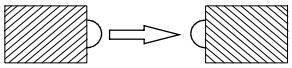
NOTE: Not all model combinations are possible. If you need assistance, please contact our technical department.

Features

- M8mm diameter
- Through-beam sensing mode
- Sn=80mm ... 3000mm
- Stainless steel housing case
- Built-in electric protection
- NPN or PNP function
- N.O., N.C. Output
- Cable version
  M8 connector



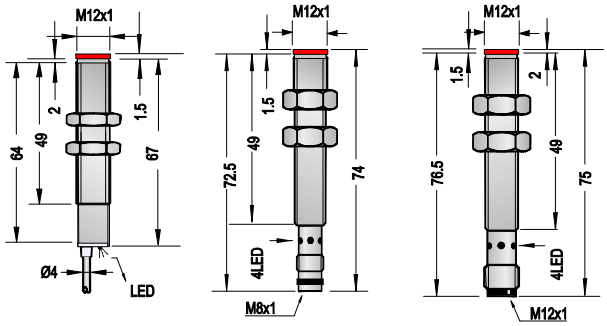
(Unit: mm)

Type			M8			
Sensing Mode			Through-beam Mode 			
Switching Distance (Sn: mm)			150mm	500mm	1000mm	3000mm
Stainless Steel Housing	Cable version	Emitter	PACK015A	PACK050A	PACK100A	PACK300A
		NPN-NO	PACC015A	PACC050A	PACC100A	PACC300A
		NPN-NC	PACD015A	PACD050A	PACD100A	PACD300A
		PNP-NO	PACA015A	PACA050A	PACA100A	PACA300A
		PNP-NC	PACB015A	PACB050A	PACB100A	PACB300A
	M8 connector	Emitter	PACK015G	PACK050G	PACK100G	PACK300G
		NPN-NO	PACC015G	PACC050G	PACC100G	PACC300G
		NPN-NC	PACD015G	PACD050G	PACD100G	PACD300G
		PNP-NO	PACA015G	PACA050G	PACA100G	PACA300G
		PNP-NC	PACB015G	PACB050G	PACB100G	PACB300G
	M12 connector	Emitter				
		NPN-NO				
		NPN-NC				
		PNP-NO				
		PNP-NC				

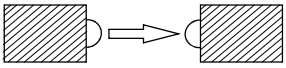
Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO,NC(Light On,Dark On)
Max. Output Current	150mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	/
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Stainless steel
Sensing Surface Material	PMMA
Sensing Object	Ø8mm or more
Connection	2m PVC Cable(Ø3 3x0.15) / M8 Connector(4 Pin Pico style)
Weight	Approx. 50g/35g

Features

- M12mm diameter
- Through-beam sensing mode
- Sn=3m ... 7m
- Nickel plated brass housing, PBT Plastic housing
- Built-in electric protection
- NPN or PNP function
- N.O., N.C. Output
- Cable version
  M8 connector
  M12 connector



(Unit: mm)

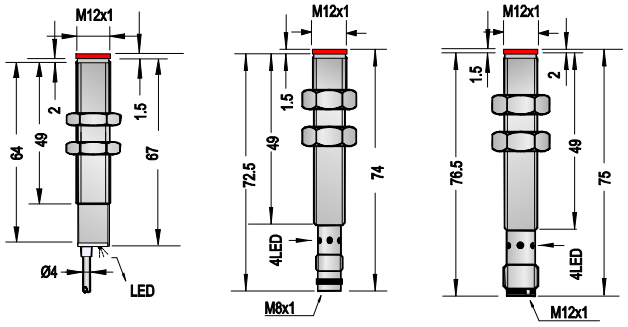
Type		M12			
Sensing Mode		Through-beam Mode 			
Switching Distance (Sn: m)		3m	5m	3m	5m
		Brass Housing		Plastic Housing	
Cable version	Emitter	PBCK300A	PBCK500A	PCCK300A	PCCK500A
	NPN-NO	PBCC300A	PBCC500A	PCCC300A	PCCC500A
	NPN-NC	PBCD300A	PBCD500A	PCCD300A	PCCD500A
	PNP-NO	PBCA300A	PBCA500A	PCCA300A	PCCA500A
	PNP-NC	PBCB300A	PBCB500A	PCCB300A	PCCB500A
M8 connector	Emitter	PBCK300G	PBCK500G	PCCK300G	PCCK500G
	NPN-NO	PBCC300G	PBCC500G	PCCC300G	PCCC500G
	NPN-NC	PBCD300G	PBCD500G	PCCD300G	PCCD500G
	PNP-NO	PBCA300G	PBCA500G	PCCA300G	PCCA500G
	PNP-NC	PBCB300G	PBCB500G	PCCB300G	PCCB500G
M12 connector	Emitter	PBCK300H	PBCK500H	PCCK300H	PCCK500H
	NPN-NO	PBCC300H	PBCC500H	PCCC300H	PCCC500H
	NPN-NC	PBCD300H	PBCD500H	PCCD300H	PCCD500H
	PNP-NO	PBCA300H	PBCA500H	PCCA300H	PCCA500H
	PNP-NC	PBCB300H	PBCB500H	PCCB300H	PCCB500H

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO+NC
Max. Output Current	150mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	Ø8mm or more
Connection	2m PVC Cable(Ø3 3x0.15) / M8 Connector(4 Pin, Pico style) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 67g/35g/40g

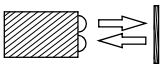
Features

- M12mm diameter
- Diffuse sensing mode
- Sn=200mm
- Nickel plated brass housing, PBT Plastic housing
- Built-in electric protection
- NPN,PNP function
- N.O., N.C. Output
- Cable version
  M8 connector
  M12 connector

CE



(Unit: mm)

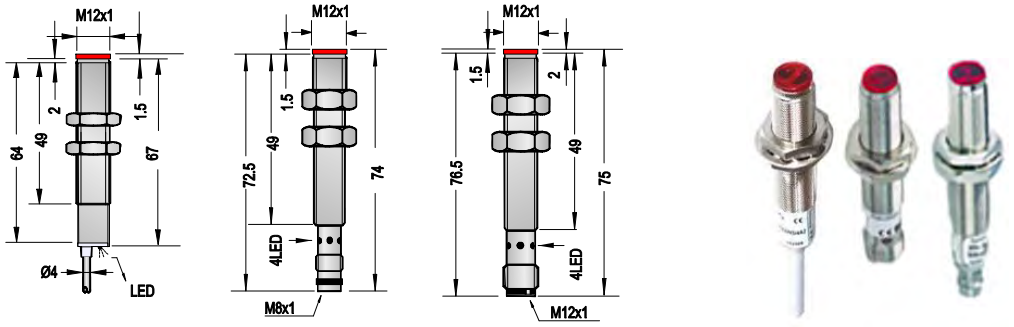
Type		M12			
Sensing Mode		Diffuse Mode 			
Switching Distance (Sn: mm)		200mm		200mm	
		Brass Housing		Plastic Housing	
Cable version	NPN-NO+NC	PBDF020A		PCDF020A	
	PNP-NO+NC	PBDE020A		PCDE020A	
M8 connector	NPN-NO+NC	PBDF020G		PCDF020G	
	PNP-NO+NC	PBDE020G		PCDE020G	
M12 connector	NPN-NO+NC	PBDF020H		PCDF020H	
	PNP-NO+NC	PBDE020H		PCDE020H	

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO+NC
Max. Output Current	150mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	10x10cm white paper(Sn=150mm) / 20x20cm white paper(Sn=500mm)
Connection	2m PVC Cable(Ø3 3x0.15) / M8 Connector(4 Pin, Pico style) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 67g/35g/40g

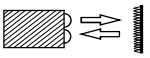
Features

- M12mm diameter
- Retro-reflective sensing mode
- Sn=1500mm, 2000mm
- Nickel plated brass housing, PBT Plastic housing
- Built-in electric protection
- NPN or PNP function
- N.O. + N.C. Output
- Cable version
  M8 connector
  M12 connector

CE



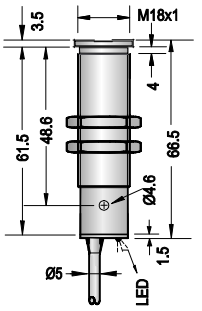
(Unit: mm)

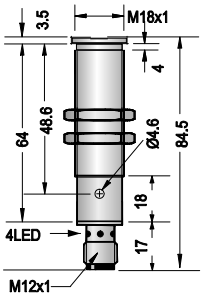
Type		M12			
Sensing Mode		Retro-reflective Mode 			
Switching Distance (Sn: mm)		1500mm	2000mm	1500mm	2000mm
		Brass Housing		Plastic Housing	
Cable version	NPN-NO+NC	PBRF150A	PBRF200A	PCRF150A	PCRF200A
	PNP-NO+NC	PBRE150A	PBRE200A	PCRE150A	PCRE200A
M8 connector	NPN-NO+NC	PBRF150G	PBRF200G	PCRF150G	PCRF200G
	PNP-NO+NC	PBRE150G	PBRE200G	PCRE150G	PCRE200G
M12 connector	NPN-NO+NC	PBRF150H	PBRF200H	PCRF150H	PCRF200H
	PNP-NO+NC	PBRE150H	PBRE200H	PCRE150H	PCRE200H

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO+NC
Max. Output Current	150mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	D51 Reflector
Connection	2m PVC Cable(Ø3 3x0.15) / M8 Connector(4 Pin, Pico style) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 67g/35g/40g

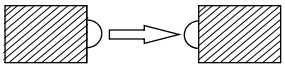
Features

- M18mm diameter
- Through-beam sensing mode
- Sn=15m
- Nickel plated brass housing, PBT Plastic housing
- Built-in electric protection
- NPN or PNP function
- NO or NC Output
  NO + NC Output
  Multifunction Output
- Cable version
  M12 connector





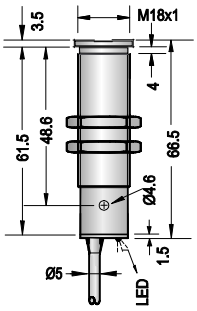
(Unit: mm)

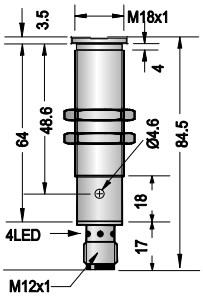
Type	M18			
Sensing Mode	Through-beam Mode 			
Switching Distance (Sn: m)	15m		15m	
	Brass Housing		Plastic Housing	
Cable version — Emitter	PDCK15MA		PECK15MA	
Cable version — NPN-NO or NC	PDCH15MA		PECH15MA	
Cable version — PNP-NO or NC	PDCG15MA		PECG15MA	
Cable version — NPN-NO + NC	PDCF15MA		PECF15MA	
Cable version — PNP-NO + NC	PDCE15MA		PECE15MA	
Cable version — Multifunction (NPN,PNP,NO.,NC.,integrated)	PDCT15MA		PECT15MA	
M12 connector — Emitter	PDCK15MH		PECK15MH	
M12 connector — NPN-NO or NC	PDCH15MH		PECH15MH	
M12 connector — PNP-NO or NC	PDCG15MH		PECG15MH	
M12 connector — NPN-NO + NC	PDCF15MH		PECF15MH	
M12 connector — PNP-NO + NC	PDCE15MH		PECE15MH	
M12 connector — Multifunction (NPN,PNP,NO.,NC.,integrated)	PDCT15MH		PECT15MH	

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO or NC / NO+NC
Max. Output Current	200mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	Ø8mm or more
Connection	2m PVC Cable(Ø5 4x0.34) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 112g/75g

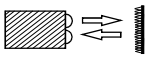
Features

- M18mm diameter
- Retro-reflective sensing mode
- Sn=3m
- Nickel plated brass housing
  PBT Plastic housing
- Built-in electric protection
- NPN or PNP function
- N.O., N.C. Output
- Cable version
  M12 connector





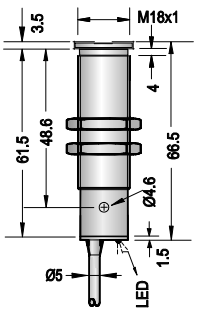
(Unit: mm)

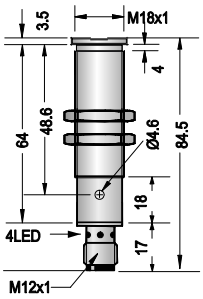
Type	M18			
Sensing Mode	Retro-reflective Mode 			
Switching Distance (Sn: m)	3m		3m	
	Brass Housing		Plastic Housing	
Cable version — Emitter				
Cable version — NPN-NO or NC	PDRH300A		PERH300A	
Cable version — PNP-NO or NC	PDRG300A		PERG300A	
Cable version — NPN-NO + NC	PDRF300A		PERF300A	
Cable version — PNP-NO + NC	PDRE300A		PERE300A	
Cable version — Multifunction (NPN,PNP,NO.,NC.,integrated)	PDRT300A		PERT300A	
M12 connector — Emitter				
M12 connector — NPN-NO or NC	PDRH300H		PERH300H	
M12 connector — PNP-NO or NC	PDRG300H		PERG300H	
M12 connector — NPN-NO + NC	PDRF300H		PERF300H	
M12 connector — PNP-NO + NC	PDRE300H		PERE300H	
M12 connector — Multifunction (NPN,PNP,NO.,NC.,integrated)	PDRT300H		PERT300H	

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO or NC / NO+NC
Max. Output Current	200mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	10x10cm white paper(Sn=150mm) / 20x20cm white paper(Sn=500mm)
Connection	2m PVC Cable(Ø5 4x0.34) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 112g/75g

Features

- M18mm diameter
- Diffuse sensing mode
- Sn=150mm ...500mm
- Nickel plated brass housing
  PBT Plastic housing
- Built-in electric protection
- NPN or PNP function
- NO or NC Output
  NO + NC Output
  Multifunction Output
- Cable version
  M12 connector





(Unit: mm)

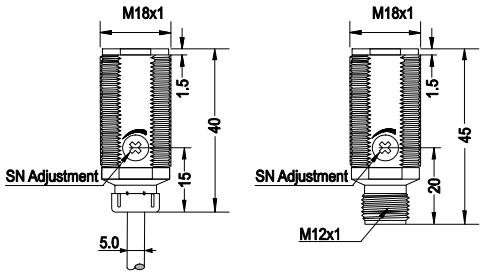
Type	M18			
Sensing Mode	Diffuse Mode			
Switching Distance (Sn: mm)	150mm	500mm	150mm	500mm
	Brass Housing		Plastic Housing	
Cable version — Emitter				
Cable version — NPN-NO or NC	PDDH015A	PDDH050A	PEDH050A	PEDH050A
Cable version — PNP-NO or NC	PDDG015A	PDDG050A	PEDG050A	PEDG050A
Cable version — NPN-NO + NC	PDDF015A	PDDF050A	PEDF050A	PEDF050A
Cable version — PNP-NO + NC	PDDE015A	PDDE050A	PEDE050A	PEDE050A
Cable version — Multifunction (NPN,PNP,NO.,NC.,integrated)	PDDT015A	PDDT050A	PEDT050A	PEDT050A
M12 connector — Emitter				
M12 connector — NPN-NO or NC	PDDH015H	PDDH050H	PEDH050H	PEDH050H
M12 connector — PNP-NO or NC	PDDG015H	PDDG050H	PEDG050H	PEDG050H
M12 connector — NPN-NO + NC	PDDF015H	PDDF050H	PEDF050H	PEDF050H
M12 connector — PNP-NO + NC	PDDE015H	PDDE050H	PEDE050H	PEDE050H
M12 connector — Multifunction (NPN,PNP,NO.,NC.,integrated)	PDDT015H	PDDT050H	PEDT050H	PEDT050H

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	75VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO or NC / NO+NC
Max. Output Current	200mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35 to 85% RH
Temperature Limit	-25°C~+55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	10x10cm white paper(Sn=150mm) / 20x20cm white paper(Sn=500mm)
Connection	2m PVC Cable(Ø5 4x0.34) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 112g/75g

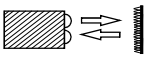
Features

- M18mm diameter
- Retro-reflective sensing mode
- Sn=5m
- ABS Plastic housing
- Built-in electric protection
- NPN or PNP function
- NO., NC. , NO.+NC.Output
- Cable version
  M12 connector version

CE



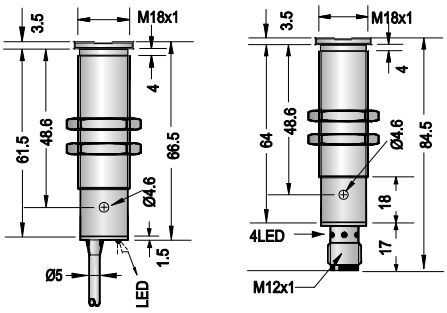
(Unit: mm)

Type		M18
Sensing Mode		Retro-reflective Mode 
Switching Distance (Sn: m)		5m
		Plastic Housing
Cable version	Emitter	
	NPN-NO or NC	
	PNP-NO or NC	
	NPN-NO + NC	PNRF500A
	PNP-NO + NC	PNRE500A
	Multifunction (NPN,PNP,NO.,NC.,integrated)	
M12 connector	Emitter	
	NPN-NO or NC	
	PNP-NO or NC	
	NPN-NO + NC	PNRF500H
	PNP-NO + NC	PNRE500H
	Multifunction (NPN,PNP,NO.,NC.,integrated)	

Nominal Voltage	10-30VDC
Rated Voltage	24VDC
Rated Insulation Voltage	500VDC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	PNP,NPN
Switching Function	NO+NC
Max. Output Current	150mA
Absorption at 30VDC	<35mA
Start-up Delay	350ms
No Load Current	<30mA
Voltage Drop	<2.5V
Output Indicator	Red LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	1ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	30 to 85% RH
Temperature Limit	-15°C~+55°C
Light Immunity	10.000Lux
Protection Degree	IP65
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	ABS Resin Plastic
Sensing Surface Material	PMMA
Sensing Object	Ø8mm Opaque objects
Connection	2m PVC Cable(Ø5) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 112g/75g

Features:

- M18mm diameter
- Nickel plated brass housing
  PBT Plastic housing
- 24-240VAC operating voltage
- N.O., N.C. Output
- IP67 protection
- Cable version
  M12 connector



(Unit: mm)

Type	M18		
Sensing Mode / Switching Distance	Through-beam Mode	Diffuse Mode	Retro-reflective Mode
	15m	150mm / 500mm	3m

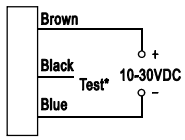
			Brass Housing		Plastic Housing	
Cable version	Through-beam Mode	Emitter	PDCL15MA		PECL15MA	
		NO	PDCP15MA		PECP15MA	
		NC	PDCQ15MA		PECQ15MA	
	Diffuse Mode	NO	PDDP015A	PDDP050A (Sn=500mm)	PEDP015A	PEDP050A (Sn=500mm)
		NC	PDDQ015A	PDDQ050A (Sn=500mm)	PEDQ015A	PEDQ050A (Sn=500mm)
	Retro-reflective Mode	NO	PDRP300A		PERP300A	
		NC	PDRQ300A		PERQ300A	
M12 connector	Through-beam Mode	Emitter	PDCL15MH		PECL15MH	
		NO	PDCP15MH		PECP15MH	
		NC	PDCQ15MH		PECQ15MH	
	Diffuse Mode	NO	PDDP015H	PDDP050H (Sn=500mm)	PEDP015H	PEDP050H (Sn=500mm)
		NC	PDDQ015A	PDDQ050A (Sn=500mm)	PEDQ015A	PEDQ050A (Sn=500mm)
	Retro-reflective Mode	NO	PDRP300H		PERP300H	
		NC	PDRQ300H		PERQ300H	

Nominal Voltage	24-240VAC
Rated Voltage	110VAC
Rated Insulation Voltage	250VAC
Residual Ripple	<10%
Tolerance	<10%Sn
Hysteresis	<10%
Emission	Infrared(880nm)
Switching Output	AC non-contact (MOSFET Output)
Switching Function	NO,NC
Max. Output Current	200mA
Absorption at 30VDC	<5mA
Start-up Delay	10ms
No Load Current	<5mA
Voltage Drop	<10VAC
Output Indicator	Yellow LED
Sensitivity Adjustment	Trimmer 1 tum
Response Time	10ms
Shock Circuit Protection	Yes
Overload Protection	Yes
Reverse Polarity Protection	Yes
Ambient Humidity	35% to 85%RH
Temperature Limit	-25°C ... +55°C
Light Immunity	>10.000Lux
Protection Degree	IP67
EMC	IEC 6094752 Part 7.4.1 and Part 7.4.2
Shock / Vibration	RFI>3V/m / EFT>1KV / ESD>4KV(contact)
Housing Material	Nickel plated brass / PBT Resin
Sensing Surface Material	PMMA
Sensing Object	>Ø8mm, through-beam / 10x10cm white papaer,diffuse Sn=150mm, 20x20cm white paper, diffuse Sn=500mm/ D51 reflector, retro-reflective
Connection	2m PVC Cable(Ø5 3x0.34) / M12 Connector(4 Pin, Euro style)
Weight	Approx. 112g/75g

TERMINAL CONNECTIONS FOR CYLINDERIAL PHOTOELECTRIC SENSORS

Emitter (Through-beam Mode)

A1 Cable Output



*Test(black wire)=0V, Emitter off

A2 M8 Pico-style

1. +V
2. Not used
3. 0V
4. Test*/Not used

Connector face view

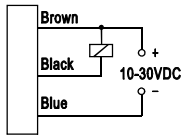
A3 M12 Euro Style

1. +V
2. Not used
3. 0V
4. Test*/Not used

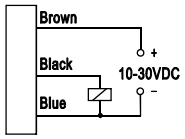
Connector face view

Receiver Cable Output (Through-beam Mode)

A4 NPN Cable Output



A5 PNP Cable Output



A6 M8 Pico-style

1. +V
2. Not used
3. 0V
4. Output

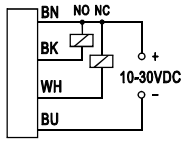
A7 M12 Euro Style

1. +V
2. Not used
3. 0V
4. Output

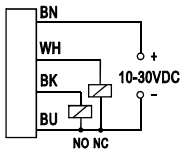
Connector face view

NO & NC Cable Output

A8 NPN Cable Output



A9 PNP Cable Output



A10 M8 Pico-style

1. +V
2. NO Output
3. 0V
4. NC Output

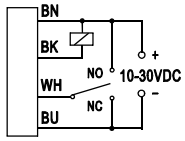
A11 M12 Euro Style

1. +V
2. NO Output
3. 0V
4. NC Output

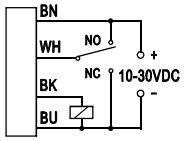
Connector face view

NO or NC Cable Output

A12 NPN Cable Output



A13 PNP Cable Output



A14 M12 Connector

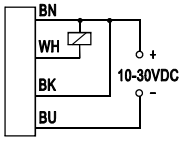
1. +V
2. NO/NC Control
3. 0V
4. Output

Connector face view

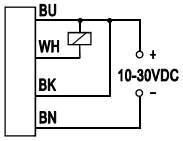
Multifunctional Output (Cable Output)

A15 Cable Output

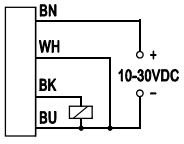
NPN-NO



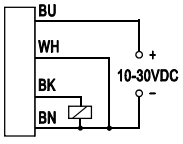
NPN-NC



PNP-NO

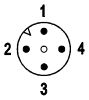


PNP-NC



A16 Euro-style M12 Connector Output

Euro-style M12

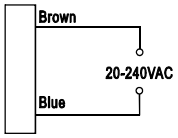


Connector face view

Output	Contact Numbers / Wire			
	1/BN	2/WH	3/BU	4/BK
NPN-NO	+	NO	-	+
NPN-NC	-	NC	+	+
PNP-NO	+	-	-	NO
PNP-NC	-	-	+	NC
Emitter	+		-	

AC Emitter

A17 Cable Output



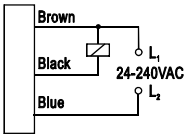
A18 M12 Euro-style

1. 0V
2. Not used
3. 24~240VAC
4. Not used

Connector face view

AC Receiver

A19 Cable Output



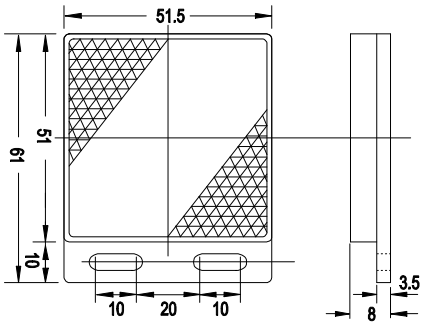
A20 M12 Euro-style

1. 0V
2. Not used
3. 24~240VAC
4. Output

Connector face view

TERMINAL CONNECTIONS FOR CYLINDERIAL PHOTOELECTRIC SENSORS

● D51 Reflectors



● D83 Reflectors